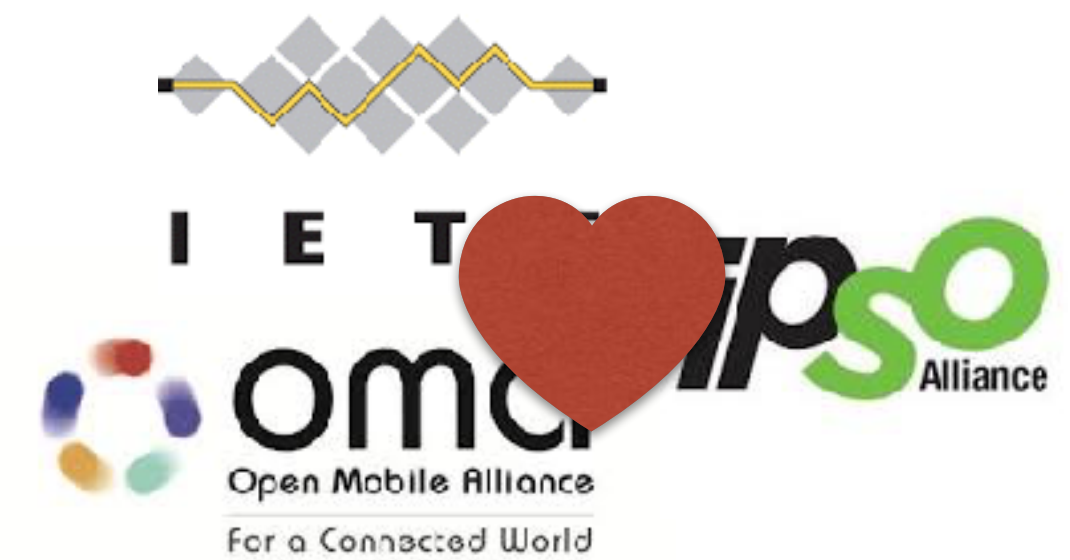


OMA, IPSO & IETF CoRE



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IETF CoRE WG Co-Chair

IPSO Smart Objects chair



@jaim - [jaimejim.github.io](https://github.com/jaimejim)

OMA F2F - Warsaw



Standards built on each other

IoT Standards That Build On Each Other

2014

- CoAP and related standards from IETF
 - REST API for constrained networks and devices
 - HTTP Proxy provides abstraction through standard web APIs
 - Core-link-format (RFC 6690) provides semantic descriptors in the form of web links
 - Resource Directory provides an API for scalable discovery and linking using core link-format mediatype
- OMA LWM2M is based on CoAP
 - Provides a server profile for IoT middleware
 - Defines a simple reusable object model
 - Defines management objects and reuses REST API for onboarding and device life cycle management
- IPSO Smart Objects are based on OMA LWM2M
 - Defines application objects using the LWM2M Object Model
 - Complex objects can be composed from simple objects
 - Easy to add new resource and object types as needed

IPSO Smart Objects

- Based on the LWM2M Object Model but for Application Data.
- Domain-specific objects created by vendors themselves.
- Provides a consistent Design Pattern and Reusable Resource Definitions.
- Non-mandatory resources can be modified, new Objects can easily be added and automatically validated.
- Released Objects are registered in OMNA and use the standard OMA DDF (XML) object descriptors.
- 53 Objects (temperature, ... stopwatch), registered with OMNA and 100 Reusable Resources.
- Openly available and easy to contribute: <http://ipso-alliance.github.io/pub>

IPSO Smart Objects

- Object representation as in LWM2M

`<object ID>/<object instance ID>/<resource ID>`

- URI

`coap://device1.example.com/3303/0/5700`

`3300` -> Temperature Sensor

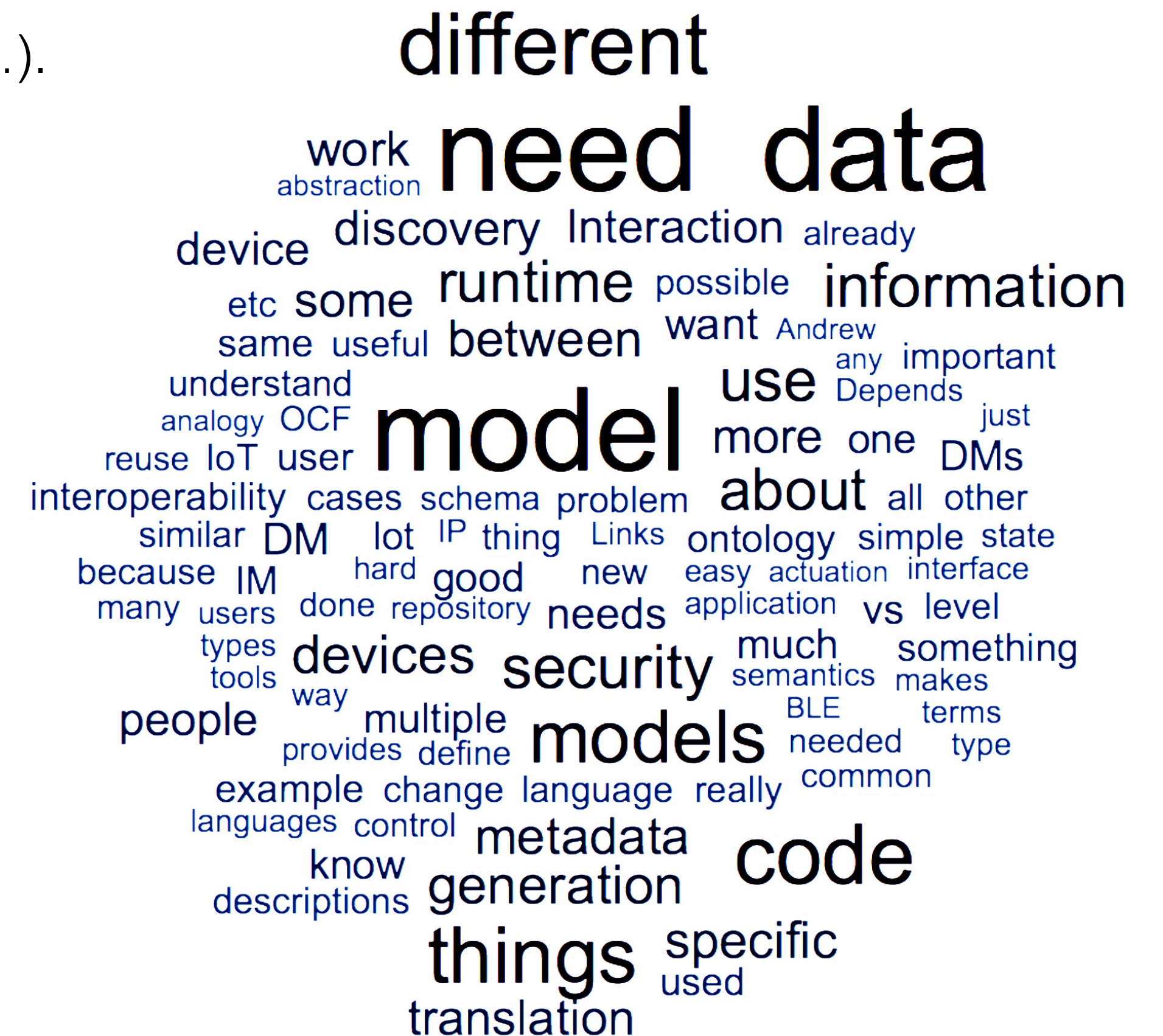
`0` -> instance 0 of a Temperature Sensor

`5700` -> resource having the current value or a most recent reading

- Implemented in Wakaama, Leshan, Contiki, LWMQN, BIPSO and products that use LWM2M.

Possible Future Work

- Alignment with other SDOs (oneIoT, WoT, Schema.org...).
 - Alignment with the community (IOTSI, WISHI...)
 - Web links + RFC6690 + Link JSON/CBOR
 - Weblinks
 - Link Relations and Anchors.
 - Link Attributes (LWM2M has some already)
 - Compact Serialisation
 - Support for `/ .well-known/core`
 - Support for Web Forms.
 - <https://tools.ietf.org/html/draft-hartke-t2trg-coral-00>
 - <https://tools.ietf.org/html/draft-koster-t2trg-hsml-01>
- ...



IOTSI Workshop
most common words.

IETF and IoT Work

- IETF's role: Specify the underlying, fundamental Internet Technologies.
- “Permissionless innovation” - so that others can build on top.

Run <IoT transfer protocol> over IP	Security for IoT (ACE, COSE)
Routing for lossy & low power networks	Thing-to-Thing communication (IRTF)
Web technology for IoT (CoRE)	Architectural oversight (IAB)

IETF CoRE WG

- 12 documents that are WG items.
- Highly relevant for LWM2M.
- Addressing CoAP protocol, security, linking, discovery, congestion control, data serialisation, modelling in YANG, HTTP Proxying, Publish-Subscribe...
- Some of them recently updated like Resource Directory or CoAP over TCP.
- More drafts on the pipeline ...

draft-ietf-core-coap-pubsub	-02	2017-07-03	Active	
draft-ietf-core-comi	-01	2017-07-18	Active	
draft-ietf-core-dynlink	-04	2017-09-14	Active	
draft-ietf-core-echo-request-tag	-00	<i>new</i> 2017-10-30	Active	
draft-ietf-core-interfaces	-10	2017-09-14	Active	
draft-ietf-core-object-security	-06	2017-10-25	Active	
draft-ietf-core-rd-dns-sd	-00	2017-07-03	Active	
draft-ietf-core-resource-directory	-12	<i>new</i> 2017-10-30	Active	
draft-ietf-core-senml	-10	2017-07-03	Active	
draft-ietf-core-sid	-02	<i>new</i> 2017-10-30	Active	
draft-ietf-core-yang-cbor	-05	2017-08-08	Active	
<i>Recently Expired:</i>				
draft-ietf-core-cocoa	-01	2017-03-13	Expired	
<i>IESG Processing:</i>				
draft-ietf-core-coap-tcp-tls	-09	2017-05-17	IESG Evaluation::AD Fo	
draft-ietf-core-links-json	-09	2017-07-03	IESG Evaluation::AD Fo	
<i>Published:</i>				
Draft name	Rev.	Dated	Status	Obsoleted by
draft-ietf-core-block	-21	2016-07-08	RFC 7959	
draft-ietf-core-coap	-18	2013-06-28	RFC 7252	(RFC 7959)
draft-ietf-core-etch	-04	2016-11-14	RFC 8132	
draft-ietf-core-groupcomm	-25	2014-09-12	RFC 7390	
draft-ietf-core-http-mapping	-17	2016-11-28	RFC 8075	
draft-ietf-core-link-format	-14	2012-06-01	RFC 6690	
draft-ietf-core-observe	-16	2014-12-30	RFC 7641	

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(There were 226 matches, and the list has been truncated. But if you want, you can [see them all.](#))

[sort by date](#) [sort by name](#)

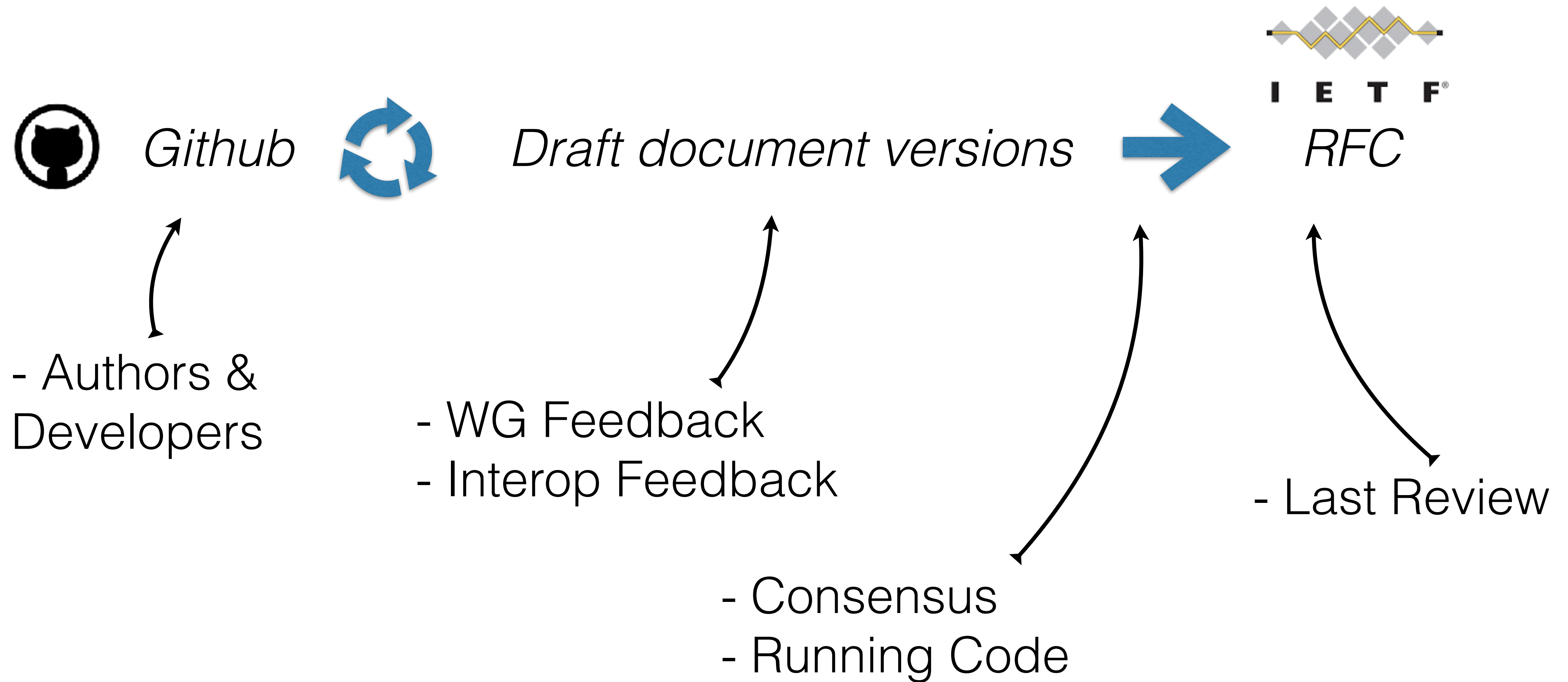
30 Oct 2017	draft-ietf-core-coap-tcp-tls	txt pdf
30 Oct 2017	draft-ietf-core-resource-directory	txt pdf xml html
30 Oct 2017	draft-arkko-core-dev-um	txt pdf
30 Oct 2017	draft-ietf-core-sid	txt pdf xml html
30 Oct 2017	draft-mattsson-core-coap-actuators	txt pdf xml html
30 Oct 2017	draft-silverajan-core-coap-protocol-negotiation	txt pdf
30 Oct 2017	draft-liu-core-coap-delay-attacks	txt pdf
30 Oct 2017	draft-ietf-core-echo-request-tag	txt pdf xml html
30 Oct 2017	draft-ietf-jmap-core	txt pdf xml html
27 Oct 2017	draft-tiloca-core-multicast-oscoap	txt pdf
27 Oct 2017	draft-toutain-core-time-scale	txt pdf xml html
25 Oct 2017	draft-ietf-core-object-security	txt pdf xml html
30 Sep 2017	draft-mattsson-core-security-overhead	txt pdf xml html
22 Sep 2017	draft-dulaunoy-misp-core-format	txt pdf xml html
14 Sep 2017	draft-ietf-core-dynlink	txt pdf
14 Sep 2017	draft-ietf-core-interfaces	txt pdf
07 Sep 2017	draft-wang-core-opcua-transmission	txt pdf
22 Aug 2017	draft-hartke-core-pending	txt pdf
08 Aug 2017	draft-ietf-core-yang-cbor	txt pdf xml html
29 Jul 2017	draft-hartke-core-e2e-security-reqs	txt pdf
24 Jul 2017	draft-veillette-core-yang-library	txt pdf xml html
18 Jul 2017	draft-bormann-core-ace-aif	txt pdf
18 Jul 2017	draft-ietf-core-comi	txt pdf xml html
03 Jul 2017	draft-ietf-core-coap-pubsub	txt pdf
03 Jul 2017	draft-ietf-core-rd-dns-sd	txt pdf xml html
03 Jul 2017	draft-ietf-core-links-json	txt pdf
03 Jul 2017	draft-ietf-core-senml	txt pdf
03 Jul 2017	draft-silverajan-core-coap-alternative-transport	txt pdf
01 Jul 2017	draft-amsuess-core-repeat-request-tag	txt pdf xml html
23 Jun 2017	draft-urien-core-identity-module-coap	txt pdf
21 Jun 2017	draft-wang-core-opcua-transmission-requirements	txt pdf
09 Jun 2017	draft-urien-core-racs	txt pdf
19 Apr 2017	draft-groves-core-rfc6690up	txt pdf xml
19 Apr 2017	draft-groves-core-senml-bto	txt pdf xml html
27 Mar 2017	draft-amsuess-core-request-tag	txt pdf xml html
13 Mar 2017	draft-groves-core-bas	txt pdf xml html
13 Mar 2017	draft-ietf-core-cocoa	txt pdf
13 Mar 2017	draft-scantek-abnf-more-core-rules	txt pdf
10 Mar 2017	draft-groves-core-senml-options	txt pdf xml html
21 Feb 2017	draft-groves-core-obsattr	txt pdf xml html
20 Feb 2017	draft-becker-core-coap-sms-gprs	txt pdf
12 Feb 2017	draft-hartke-core-apps	txt pdf
18 Jan 2017	draft-vanderstok-core-comi	txt pdf xml html
06 Dec 2016	draft-garcia-core-app-layer-sec-with-dtls-record	txt pdf xml html
28 Nov 2016	draft-ietf-core-http-mapping	txt pdf xml html

14 Nov 2016	draft-ietf-core-etch	txt pdf xml html
31 Oct 2016	draft-thaler-core-redirect	txt pdf
29 Oct 2016	draft-vanderstok-core-coap-est	txt pdf xml html
27 Oct 2016	draft-vanderstok-core-yang-lwm2m	txt pdf xml html
27 Oct 2016	draft-cao-core-delegated-observe	txt pdf
23 Aug 2016	draft-veillette-core-cool-library	txt pdf xml html
18 Aug 2016	draft-vanderstok-core-cbor-yid	txt pdf xml html
16 Aug 2016	draft-bierman-core-yid	txt pdf xml html
18 Jul 2016	draft-veillette-core-cool	txt pdf xml html
08 Jul 2016	draft-somaraju-core-sid	txt pdf xml html
08 Jul 2016	draft-ietf-core-block	txt pdf xml html
08 Jul 2016	draft-bormann-core-groupcomm-cbor	txt pdf
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08 Jul 2016	draft-koster-core-coap-pubsub	txt pdf xml html
06 Jul 2016	draft-groves-core-dynlink	txt pdf xml html
04 Jul 2016	draft-zheng-core-coap-lantency-evaluation	txt pdf
28 Jun 2016	draft-bormann-core-coap-sig	txt pdf
16 Jun 2016	draft-savolainen-core-coap-websockets	txt pdf
10 Jun 2016	draft-bormann-core-block-bert	txt pdf
10 Jun 2016	draft-gomez-core-tcp-constrained-node-networks	txt pdf xml html
15 Apr 2016	draft-vasu-ace-core-access-privilege-provisioning	txt pdf
05 Apr 2016	draft-jennings-core-senml	txt pdf
21 Mar 2016	draft-fang-core-coap-pubsub-failure-detection	txt pdf
21 Mar 2016	draft-vanderstok-core-etch	txt pdf
18 Mar 2016	draft-rahman-core-advanced-rd-features	txt pdf xml html
15 Mar 2016	draft-vanderstok-core-patch	txt pdf xml html
11 Mar 2016	draft-veillette-core-yang-cbor-mapping	txt pdf xml html
11 Mar 2016	draft-turner-core-cool-problem-statement	txt pdf xml html
07 Mar 2016	draft-vanderstok-core-mpl-yang	txt pdf xml html
29 Feb 2016	draft-fossati-core-server-name-id	txt pdf xml html
17 Feb 2016	draft-pelov-core-cosol	txt pdf xml html
10 Feb 2016	draft-bierman-core-yang-hash	txt pdf xml html
03 Nov 2015	draft-tschofenig-core-coap-tcp-tls	txt pdf
19 Oct 2015	draft-bormann-core-coap-fetch	txt pdf
19 Oct 2015	draft-vasu-core-ace-service-provisioning	txt pdf
30 Sep 2015	draft-zotti-core-sleepy-nodes	txt pdf xml html
14 Sep 2015	draft-hartke-core-lighting	txt pdf
06 Jul 2015	draft-fossati-core-certmode-rd-names	txt pdf xml html
02 Jul 2015	draft-castellani-core-advanced-http-mapping	txt pdf xml html
29 Jun 2015	draft-seitz-ace-core-authz	txt pdf
17 Jun 2015	draft-carey-core-std-msg-vs-trans-adapt	txt pdf xml html
08 Jun 2015	draft-ietf-scim-core-schema	txt pdf xml html
09 Mar 2015	draft-bormann-core-cc-qg	txt pdf
09 Mar 2015	draft-li-core-cbor-equivalents	txt pdf xml html

Possible LWM2M Additions

- *[RFC7252]* Support of PATCH/FETCH methods, it'd be greatly beneficial for firmware upgrade or observing relatively large sets of resources.
- *[RFC7641]* Support of observe between LWM2M Clients in order to subscribe to updates from one another.
- *[RFC8075]* In cases of GWs that need to implement a HTTP to CoAP proxy.
- *[I-D.ietf-core-coap-tcp-tls]* **(new)** outlines the changes required to use CoAP over TCP, TLS, and WebSockets transports.
- *[I-D.ietf-core-resource-directory]* **(new)** Other than traditional LWM2M, CoAP's in-built discovery would be beneficial to support device-to-device cases. New version just published, <https://tools.ietf.org/html/draft-ietf-core-resource-directory-12>
- *[I-D.ietf-core-object-security]* **(new)** For systems in which endpoints work behind a gateway or use LWM2M for managing the gateways, it might be good to implement other types of cryptographic protection than TLS/DTLS.

Ways of Working



Assorted References

REST	https://www.ics.uci.edu/~fielding/pubs/dissertation/rest_arch_style.htm
CoAP	https://tools.ietf.org/html/rfc7252
CoRE Link-Format	https://tools.ietf.org/html/rfc6690
CoAP Observe	https://tools.ietf.org/html/rfc7641
CBOR	https://tools.ietf.org/html/rfc7049
IOTSI	https://www.iab.org/activities/workshops/iotsi/
IOTSU	https://www.iab.org/activities/workshops/iotsu/
CoRE RD	https://datatracker.ietf.org/doc/draft-ietf-core-resource-directory/
LWM2M	https://github.com/OpenMobileAlliance/
CoMI	https://tools.ietf.org/wg/core/draft-ietf-core-yang-cbor/
WISHI	https://wishi.space
CoAP TCP+TLS	https://tools.ietf.org/wg/core/draft-ietf-core-coap-tcp-tls/
IPSO	http://ipso-alliance.github.io/pub/
LWM2M to YANG	https://tools.ietf.org/html/draft-vanderstok-core-yang-lwm2m-00
OSCOAP	https://tools.ietf.org/wg/core/draft-ietf-core-object-security/
CoAP for LWM2M	https://tools.ietf.org/html/draft-jimenez-t2trg-coap-functionality-lwm2m